crested. (S. pusilla, *Pursh.*) — In mud or shallow water, near the coast; N. Y. to Fla.

Var. (?) **gracíllima,** Watson. Scape and the almost or wholly bladeless leaves very slender and greatly elongated (2–4° long, 1″ wide); pedicels all elongated, in usually distant whorls, the lower pistillate, slender and spreading; fruit unknown. (S. natans, *Engelm.* in Torr. Bull. ix. 4.) — In deep water of streams in E. Mass. (*Hitchings, Boott, C. E. Faxon*, etc.) Wholly submerged, only 1 or 2 flowers appearing at a time, floating on the surface. The fruit, maturing under water, has not yet been collected.

§ 2. LOPHIOCÁRPUS. *Fertile flowers perfect; stamens 9–15, at the base of the receptacle; sepals erect and embracing the fruit.*

7. **S. calycina,** Engelm. Scape weak (3–9′ high), at length mostly procumbent; usually only the lowest whorl fertile, with pedicels as long as those of the sterile flowers, recurved in fruit; bracts orbicular, obtuse or rarely pointed; filaments slightly rough, as long as the anthers; achenes obovate with a short horizontal style; leaves broadly halberd-shaped, obtuse or acutish, with wide spreading lobes, often wider than long, or lanceolate or sometimes reduced to linear phyllodia. — Maine to Del., west to Wisc., Mo., and Tex. Quite variable, several forms being enumerated, as var. SPONGIÒSA, with spongy texture and bladeless submerged leaves, eastward; and westward, var. FLÙITANS, with lance-linear floating leaves.

3. ECHINÓDORUS, Richard.

Flowers perfect. Petals imbricated in the bud. Stamens 6–21 or more. Ovaries several or many, imbricated in a head, forming thick and ribbed achenes in fruit, often beaked with a projecting persistent style. — Mostly annuals, with the habit of Sagittaria, the naked stems sparingly branched or simple, and the flowers on rather short pedicels, in whorls of 3–6 or more. Fl. summer and autumn. (Name from *ἐχινώδης, prickly*, or from *ἐχῖνος*, and *δορός, a leathern bottle*, applied to the ovary, which is in most species armed with the persistent style, so as to form a sort of prickly head of fruit.)

1. **E. párvulus,** Engelm. Scapes 1–3′ high; shoots often creeping and proliferous; *leaves lanceolate or spatulate, acute* (½–1½′ long, including the petiole); umbel single, 2–8-flowered; pedicels reflexed in fruit; flower 3″ broad; *stamens* 9; *styles much shorter than the ovary; achenes beakless*, obtusely few-ribbed. — In mud, Mass. to Mich. and E. Minn., south to Fla. and Tex. (S. Am.)

2. **E. rostràtus,** Engelm. *Scape erect*, 3′–2° high, longer than the leaves; *leaves broadly ovate, cordate or truncate at base, obtuse* (the blade 1–3′ long); umbel proliferous, in a branched panicle; flower 5″ broad; *stamens* 12; *styles longer than the ovary; achenes beaked*, acutely many-ribbed. — Swamps and ditches, Ill to Fla., Mo., and Tex. — A low form (var. LANCEOLÀTUS, Engelm.) has the leaves lanceolate with an acute base. Ill., Mo.

3. **E. radicans,** Engelm. *Stems or scape prostrate, creeping* (2–4° long), proliferous, bearing many whorls of flowers; leaves somewhat truncately broadly heart-shaped, obtuse (2–8′ broad), long-petioled; flowers 6–9″ broad; *stamens about* 21; *styles shorter than the ovary; achenes short-beaked*, the keeled back denticulate. — Swamps, Ill. to N. C. and Fla., west to Mo. and Tex.

ORDER 126. NAIADÀCEÆ. (PONDWEED FAMILY.)

Marsh or mostly immersed aquatic herbs, with stems jointed and leafy or (in Triglochin) *naked and scape-like, leaves sheathing at base or stipulate, and flowers perfect or unisexual, often spathaceous, with perianth of* 4 *or* 6 *herbaceous distinct valvate segments, or membranous and tubular or cup-shaped, or none.* Stamens 1, 2, 4 or 6, with extrorse anthers. Ovaries 1–6, distinct or more or less coherent, 1-celled, usually 1-ovuled, in fruit follicular or capsular or an indehiscent berry or utricle.

SUBORDER I. **Juncagineæ.** Marsh plants, with terete bladeless leaves; flowers perfect, spicate or racemose, with herbaceous 6- (rarely 3-) lobed perianth; carpels 3 or 6, more or less united, separating at maturity. Seeds anatropous; embryo straight.

1. **Triglochin.** Ovaries 3–6, united until maturity. Leaves radical. Flowers bractless, in a spike-like raceme terminating a jointless scape.
2. **Scheuchzeria.** Ovaries 3, nearly distinct, at length divergent. Flowers bracteate in a loose raceme upon a leafy stem.

SUBORDER II. **Naiadeæ.** Immersed aquatics, with flat leaves; ovaries solitary or distinct, 1-ovuled.

+ Flowers perfect, spiked or clustered; anthers 4 or 2, sessile; leaves alternate.

3. **Potamogeton.** Spike peduncled. Sepals 4, herbaceous. Anthers 4. Ovaries 4, sessile.
4. **Ruppia.** Flowers on an enclosed spadix, at length long-exserted, without perianth. Anther-cells 4, distinct. Ovaries 4, becoming stipitate.

+ + Flowers monœcious or diœcious, axillary, naked, monandrous; leaves opposite (alternate in n. 6).

5. **Zannichellia.** Monœcious. Pistils (2–5) from a cup-shaped involucre or sheath.
6. **Zostera.** Pistils and stamens alternate in 2 vertical rows on the inner side of a leaf-like enclosed spadix. Stigmas 2, linear. Stem creeping.
7. **Naias.** Diœcious; pistil solitary, naked. Stamen enclosed in a membranous spathe. Stems floating, with opposite or ternate leaves.

1. TRIGLÒCHIN, L. ARROW-GRASS.

Sepals and petals nearly alike (greenish), ovate, concave, deciduous. Stamens 3–6; anthers oval, on very short filaments. Pistils united into a 3–6-celled compound ovary; stigmas sessile; ovules solitary. Capsule splitting when ripe into 3–6 carpels, which separate from a persistent central axis. — Perennials, with rush-like, fleshy leaves, below sheathing the base of the wand-like naked and jointless scape. Flowers small, in a spiked raceme, bractless. (Name composed of *τρεῖς, three*, and *γλωχίν, point*, from the three points of the ripe fruit in n. 1 when dehiscent.)

* *Fruit of* 3 *carpels.*

1. **T. palústris,** L. Scape (6–18′ high) and leaves slender; *sepals and stamens* 6; *fruit linear-club-shaped; carpels* when ripe separating from below upward, leaving a triangular axis, *awl-pointed at base.* — Marshes, western N. Y. to Ill., Minn., and westward. Aug. (Eu., Asia, etc.)

2. **T. striàta,** Ruiz & Pav. Scape (6–12′ high) and leaves slender; flowers very small; *sepals and stamens* 3; *fruit globose-triangular*, or when dry 3-lobed. (T. triandra, *Michx.*) — Sea-shore, Md. to Fla. (S. Am., etc.)

* * *Fruit of* 6 *carpels* (*rarely* 5).

3. **T. marítima,** L. Scape (1–3° high) and leaves thickish, fleshy; fruit ovate or oblong, acutish; carpels rounded at base and slightly grooved on the back, the edges acute. — Salt-marshes along the coast, Lab. to N. J., and in saline, boggy or wet places across the continent. (Eu., Asia, etc.)

2. SCHEUCHZÈRIA, L.

Sepals and petals oblong, spreading, nearly alike (greenish-yellow), but the latter narrower, persistent. Stamens 6; anthers linear. Ovaries 3, globular, slightly united at base, 2–3-ovuled, bearing flat sessile stigmas, in fruit forming 3 diverging and inflated 1–2-seeded pods, opening along the inside. — A low bog-herb, with a creeping jointed rootstock, tapering into the ascending simple stem, which is zigzag, partly sheathed by the bases of the grass-like conduplicate leaves, and terminated by a loose raceme of a few flowers, with sheathing bracts; leaves tubular at the apex. (Named for *John* and *John Jacob Scheuchzer*, distinguished Swiss botanists early in the 18th century.)

1. **S. palústris,** L. — Peat-bogs, N. Brunswick to N. J., westward across the continent. June. (Eu., Asia.)

3. POTAMOGÈTON, Tourn. PONDWEED.

Flowers perfect. Sepals 4, rounded, valvate in the bud. Stamens 4, opposite the sepals; anthers nearly sessile, 2-celled. Ovaries 4 (rarely only one), with an ascending campylotropous ovule; stigma sessile or on a short style. Fruit drupe-like when fresh, more or less compressed; endocarp (*nutlet*) crustaceous. Embryo hooked, annular, or cochleate, the radicular end pointing downward. — Herbs of fresh, or one in brackish, ponds and streams, with jointed mostly rooting stems, and 2-ranked leaves, which are usually alternate or imperfectly opposite; the submersed ones pellucid, the floating ones often dilated and of a firmer texture. Stipules membranous, more or less united and sheathing. Spikes sheathed by the stipules in the bud, mostly raised on a peduncle to the surface of the water. (An ancient name, composed of *ποταμός, a river*, and *γείτων, a neighbor*, from the place of growth.) — By *fruit*, the full-grown fresh or macerated fruit is intended; by *nutlet*, that with the fleshy outer portion or epicarp removed. All except n. 19 flower in summer: the month mentioned indicates the time of ripening of the fruit.

§ 1. *Leaves of two sorts; floating ones more or less coriaceous, with a dilated petioled blade, different in form from the thinner submersed ones.*

* *Submersed leaves reduced to narrowly grass-like or filiform sessile phyllodia.*

+– *Stems rather stout; stipules free; spikes all emersed, cylindrical and densely fruited; fruits fleshy and turgid, obliquely obovate.*

1. **P. nàtans,** L. *Stem simple or sparingly branched;* floating leaves all long-petioled, elliptical or ovate, somewhat cordate at base, obtuse but with a blunt point, 21–29-nerved; upper submersed leaves lanceolate, early perishing, the lower (later in the season) very slender (3–7′ long, barely 1″ wide); upper *stipules very long, acute; peduncle about the thickness of the stem;* spikes 1–2′ long; sides of the turgid *nutlet with a small deep impression in the middle;* embryo coiled into an incomplete elliptical ring. — Ponds and ditches, N. Scotia to Va., westward across the continent. In deeper or flowing water the plant becomes more slender and often wholly submersed (var. PROLÍXUS, *Koch*). — Aug., Sept. (Eu., Asia.)

2. **P. Oakesiànus,** Robbins. Stem more slender, *much branched;* floating leaves smaller (1–1½′ long), ovate- or oblong-elliptical, obtuse, fewer- (17–23-) nerved; lowest submersed ones almost capillary (only ¼–½″ wide), continuing through the flowering season; spikes shorter (¾–1′ long), on *peduncles much thicker than the stem;* fruit smaller and more acute; *sides of the turgid nutlet not at all impressed;* curvature of the embryo nearly circular, its apex directed to a point above its base. — Ponds, and especially pools and stagnant ditches, Mass. to N. J.; also Anticosti. Aug.

3. **P. Pennsylvánicus,** Cham. *Stems compressed,* often simple from the creeping rootstocks; floating leaves chiefly opposite (1–3½′ long), 11–17-nerved, oblong, tapering into a *short petiole,* the lower gradually narrowing and passing into the submersed ones, which are very numerous and approximate, 2-ranked, linear (2–5′ long, and 1–2½″ wide), 5–7-nerved, the lateral nerves slender and nearly marginal, the space within the inner nerves *coarsely cellular-reticulated; stipules very obtuse;* spikes numerous, about the length of the thickened peduncle; *fruit round-obovate,* flattish, 3-keeled when dry; *nutlet distinctly impressed on the sides;* curvature of the embryo transversely oval. (P. Claytonii, *Tuckerm.*) — Still or flowing water, N. Brunswick to S. C., west to N. Ind. and Minn. July, Aug.

+– +– *Like the preceding section, but all the parts small, slender and delicate, only the fertile plants producing floating leaves; spikes very small and few-flowered; propagated by autumn buds.*

4. **P. Vasèyi,** Robbins. Very delicate; stem almost capillary; *floating leaves obovate* (3–5″ long) and about the length of their filiform petioles, with 5 nerves deeply impressed beneath, cross-veins distinct; submersed leaves filiform-linear, very attenuate (1–2′ long, ⅛–¼″ wide) and acute; *stipules* not adnate, scarious, *long,* acute; spikes all emersed, few, interrupted-oblong, 3–5-flowered, on a thickish peduncle; fruit oblique, round-obovate (⅔″ long), compressed, slightly sharp-margined, tipped with a distinct recurved style, the sides impressed and face acute; upper portion of the embryo circularly incurved, its apex transverse to the fruit. — Canada and N. Eng.; also Ill. The fruiting form, with floating leaves, rare; the submerged form apparently much more abundant.

5. **P. lateràlis,** Morong. Stem filiform, branching; *floating leaves elliptical* (4–6″ long by 2″ wide), with 5–7 nerves deeply impressed beneath, tapering at base into a somewhat dilated petiole shorter than the blade; *submersed leaves linear,* acute (1–3′ long by ¼–½″ wide), 1–3-nerved, the midnerve with fine veins or cellular reticulations on each side, bi-glandular at base; *stipules short; peduncles with a very peculiar lateral appearance,* widely spreading at maturity, sometimes even recurved, often thicker than the stem; spikes often interrupted (2–4-flowered); fruit obliquely obovate (hardly 1″ long), the back much curved, with two fine grooves upon it; embryo oval in its curve, the apex nearly touching the base. — Mass and Mich.; rare. Undeveloped specimens resemble P. pusillus.

← ← ← *Stems slender or filiform, much branched; floating leaves sometimes wanting; stipules adnate to the base of the leaf; spikes of two kinds, one emersed, cylindrical and many-flowered, on a club-shaped peduncle, the other submersed, globular and few-flowered; fruit flat, cochleate, with thin or scarcely any flesh and a thin nutlet; embryo spiral.*

6. **P. Spirillus,** Tuckerm. Floating leaves oval to lance-oblong and lanceolate (the largest 10″ long, 4″ wide), usually obtuse, about equalling the *rather dilated petioles*, with 5 – many nerves beneath deeply impressed; upper submersed leaves either with or without a lance-oblong or broad-linear proper blade; the numerous lower ones narrow-linear, tapering toward the obtuse apex (¾ – 1½′ long, ¼ – ⅜″ wide); stipules early lacerate; *submersed flowers usually solitary on very short erect peduncles; fruit* with the back either *winged and with 4 – 5 distinct teeth or wingless and entire; embryo coiled 1¾ turns.* — Rivers, and even far up small streams, N. Eng. to Va., west to Mich. and Mo. June – Aug. — Stem less slender than in the next.

7. **P. hybridus,** Michx. Floating leaves oval to lance-oblong (the largest 10″ long, 6″ wide), often acute, longer than the *filiform petioles*, with about 5 – 7 nerves beneath deeply impressed; submersed leaves very numerous, almost setaceous (1 – 3′ long, very rarely ½″ wide); stipules obtuse; emersed spikes 4 – 7″ long; *submersed* spikes 1 – 4-flowered, their *peduncles* (of their own length) *frequently recurved; fruit minute, about 8-toothed on the margin; embryo coiled 1½ turns.* — Shallow stagnant waters, N. Brunswick to Fla., west to Mich., Mo., and N. Mex. June – Aug.

* * *Submersed leaves lanceolate, rarely oval or linear, membranaceous; spikes dense, many-flowered, on stout peduncles.*

8. **P. ruféscens,** Schrad. Stem simple; floating leaves (often wanting) 2 – 5′ long, rather thin, *wedge-oblanceolate, narrowed into a short petiole*, 11 – 17-nerved; *submersed leaves almost sessile*, lanceolate and lance-oblong, smooth on the margin, fewer-nerved; stipules broad, hyaline, obtuse, upper ones acuminate; spike 1 – 2′ long, often somewhat compound; fruit obovate, lenticular, pitted when immature, with an acute margin and pointed with the rather long style; embryo incompletely annular. — In streams or ponds, N. Brunswick to N. J., west to Minn. and Tex. Aug., Sept. (Eu.)

9. **P. flùitans,** Roth. Stem often branching below; *floating leaves thinnish, lance-oblong or long-elliptical*, often acute, *long-petioled*, 17 – 23-nerved; *submersed leaves very long* (3 – 12′, by 2 – 12″ wide), *lanceolate and lance-linear*, 7 – 15-nerved, coarsely reticulated; peduncles somewhat thickened upward; fruit obliquely obovate, obscurely 3-keeled when fresh, and distinctly so when dry, the middle one winged above and sometimes with 3 – 5 shallow indentations; the rounded slightly curved face surmounted by the short style; nutlet with the sides scarcely impressed; upper part of the embryo circularly incurved. (P. lonchites, *Tuckerm.*) — In streams or rarely in ponds, N. Brunswick to N. J., west to Minn. and Iowa. Aug., Sept. (Eu.)

10. **P. púlcher,** Tuckerm. Stem simple, black-spotted; *leaves of three kinds;* floating ones becoming very large (4½ by 3½′), *roundish-ovate and cordate or ovate-oblong*, 25 – 37-nerved, *all alternate; upper submersed ones* (3 – 5) *usually lanceolate*, acute at base and very long-acuminate, 10 – 15-nerved, very thin, cellular each side of the midrib, undulate, short-petioled; *lowest* (2 – 4 near the base of the stem) *thicker, plane, oval or oblong* with a rounded base, or spatulate-oblong, on longer petioles; stipules rather short and obtuse; peduncles thicker than the stem; fruit with a rounded back and angular face, pointed, distinctly 3-keeled when fresh, sharply so when dry; nutlet with two deep dorsal furrows, and a sinus below the angle in front; sides flat; embryo circularly much incurved above. — Ponds, Vt. to Ga. and Mo. July, Aug.

11. **P. amplifòlius,** Tuckerm. Stems simple, of very variable length; *floating leaves* (sometimes wanting) large, *oblong or lance-ovate*, sometimes slightly cordate at base, abruptly acutish, 30 – 50-nerved, on *rather long petioles;* submersed leaves often very large (reaching 7′ by 2′), lanceolate or oval, acute at each end, *usually much recurved, undulate*, mostly on short petioles; *stipules very long and tapering to a point*, soon becoming loose; peduncles thickened upward, in deep water much elongated; fruit very large (over 2″ long), rather obliquely obovate, 3-keeled, with a broad stout beak; nutlet slightly impressed on the sides; upper part of the embryo curved into a ring. — Ponds and rivers, N. Eng. to N. J., west to Minn. and Kan. Aug., Sept.

12. **P. Illinoénsis,** Morong. *Stem stout, branching* towards the summit; floating leaves opposite, oval or ovate (2 – 5′ long by 1½ – 2′ broad), 19 – 25-nerved, rounded or subcordate at base, with a short blunt point at apex, on short petioles; *submersed leaves rather few, oblong-elliptical*, acute at each end, *usually ample* (largest 8′ by 1½′); *stipules coarse, obtuse, strongly bicarinate* (2′ long); peduncles often clustered at the summit (2 – 4′ long), thickening upward; *fruit roundish-obovate* (1¾ – 2″ long), 3-keeled on the back, middle keel prominent; nutlet flattened and slightly impressed on the sides, obtuse or pointed at base; apex of embryo directed transversely inward. — Streams and ditches, western N. Y. to Ill., Iowa, and Minn. Very near the last.

13. **P. heterophýllus,** Schreb. *Stem slender, very branching* below; floating leaves mostly thin, variable, but with a short blunt point, 9 – 15-nerved, usually 1 – 2′ long and 6 – 9″ wide; submersed ones usually lanceolate or linear-lanceolate, acuminate or cuspidate, narrowed toward the base, about 7-nerved on the stem and 3-nerved on the branches; upper ones petioled, lower sessile; *stipules obtuse*, loose; peduncles somewhat thickened upward; fruit small, roundish, compressed, scarcely keeled; embryo annular above. (P. gramineus, *Fries.*) — Still or flowing water, common. Varies exceedingly in its submersed leaves, peduncles, etc.; the var. GRAMINIFÒLIUS (Fries), growing in rapid streams, with stems much elongated and less branched, and the flaccid submersed leaves 2 – 7′ long by 2 – 10″ wide.

Var. (?) **myriophýllus,** Robbins. Sending up from running rootstocks many short repeatedly dichotomous and densely leafy stems; fertile stems very slender; floating leaves small, delicate, lance-oblong, on long filiform petioles; submersed stem-leaves larger, early perishing; those of the branches (deep-green) linear-oblanceolate, very small (¾ – 1′ long), acute, sometimes minutely serrulate; spike slender, loosely-flowered, much shorter than the thickened peduncle. — Apponaug Pond, R. I., without fruit.

13ª. **P. Zízii,** Mert. & Koch. Resembling P. lucens, but smaller, much branched at base; *upper leaves coriaceous or subcoriaceous, long-petioled* and *sometimes emersed*, the others subsessile, all usually numerous, undulate and *shining;* peduncle elongated. (P. lucens, var. minor, *Nolte.* Also P. gramineus, var. (?) spathulæformis, *Robbins;* P. spathæformis, *Tuckerm.*; "P. vari-

ans, *Morong.*") — N. Eng. to Fla., and westward. Connecting with the next section. (Eu.)

§ 2. *Leaves all submersed and similar, mostly sessile, membranaceous and dilated, lanceolate, oblong, or oval; stipules obtuse, becoming loose.*

14. **P. lùcens,** L. Stem thick, branching, sometimes very large; *leaves more or less petioled*, oval or lanceolate, *mucronate*, often rough-serrulate, *frequently shining;* peduncles often elongated; *fruit* roundish and compressed, *with obtuse margins, slightly keeled;* embryo circularly incurved above. — Ponds, N. Eng. to Fla., west to the Pacific. Aug., Sept. (Eu.)

Var. (?) **Connecticuténsis,** Robbins. Stem flexuous; *leaves* all submersed, nearly sessile, lanceolate, *acuminate, crisped, not shining nor serrulate; fruit larger, distinctly keeled;* nutlet thick and hard. — Lake Saltonstall, East Haven, Conn.

15. **P. prælóngus,** Wulf. Stem very long, branching, flexuous; *leaves* lance-oblong or lanceolate (sometimes 7′ long), *half-clasping, obtuse with a boat-shaped cavity* at the extremity, thence splitting on pressure; stipules scarious, very obtuse; spikes rather loose-flowered; *peduncles very long* (sometimes reaching 20′); *fruit* obliquely obovate, compressed, *sharply keeled* when dry; style terminating the nearly straight face; curve of the embryo oval and longitudinal. — Ponds and large rivers, N. Scotia to Mass., west to Minn. and Iowa. Sept., Oct. — Stem white; foliage bright green. (Eu.)

16. **P. perfoliàtus,** L. Stem branching; *leaves orbicular, ovate or lanceolate from a cordate-clasping base,* usually obtuse and often minutely serrulate; peduncles short, cylindrical; *fruit* irregularly obovate, *obtusely margined;* embryo incurved in an oval. — Ponds and slow streams, common. N. Scotia to Fla., west to Minn. and Iowa. Sept., Oct. (Eu.)

Var. **lanceolàtus,** Robbins. Larger; *leaves long-lanceolate* from a cordate-clasping base and *acuminate*, wavy, 3 – 4½′ long; *peduncles thickened upward.* — Same range as the species, and extending west to the Pacific.

17. **P. crìspus,** L. *Stem compressed; leaves linear-oblong,* half-clasping, obtuse, *serrulate, crisped-wavy, 3-nerved; fruit long-beaked;* upper portion of the embryo incurved in a large circle. — Flowing and stagnant waters, Mass. to N. J. and Va., west to western N. Y. June, July. (Eu.)

18. **P. Mýsticus,** Morong. *Stem very slender* and irregularly branching, nearly filiform (1 – 3° high); *leaves oblong-linear* (½ – 1½′ long by 2 – 3″ wide), 5 – 7-nerved, *finely undulate and entire, obtuse or bluntly pointed, abruptly narrowing at base, sessile or partly clasping;* spikes few, capitate (4 – 6-flowered), on erect peduncles (1 – 2′ long); fruit (immature) obovate, small (hardly ¾″ long), *obscurely 3-keeled on the back,* a little beaked by the slender recurved style. — Mystic Pond, Medford, Mass.

§ 3. *Leaves all submersed and similar, mostly membranaceous and sessile, linear or setaceous.*

* *Stipules free from the sheathing base of the leaf.*

19. **P. zosteræfòlius,** Schum. *Stem branching, wing-flattened; leaves* linear and grass-like (commonly 4′ by 1½″), *abruptly pointed, with many fine and 3 larger nerves;* stipules (seen young) oblong, very obtuse; *spikes cylindrical,* 12 – 15-flowered, *not half as long as the peduncle;* fruit obliquely obovate, somewhat keeled and with slight teeth on the back, the sides not impressed,

the face arching and terminated by the short style; *summit of the large embryo lying transverse to the fruit.* (P. compressus, *Fries;* not *L.*?) — Still and slow-flowing waters, N. Eng. to N. J., Iowa, and Minn. Aug., Sept. (Eu.)

20. **P. Hillii,** Morong. Stem slender, *widely branching, flattish;* leaves linear, *acute* (1 – 2½′ long by ½ – 1¼″ wide), *3-nerved,* the lateral nerves delicate and near the margin; stipules whitish, striate, obtuse (3 – 5″ long); *spikes capitate* (3 – 6-fruited), *on short spreading or recurved peduncles;* fruit as in the last. — Mich. and western N. Y.

21. **P. obtusifòlius,** Mertens & Koch. *Stem flattened, very branching; leaves* linear, tapering toward the base, obtuse and mucronate or very acute, 3- (*rarely* 5-) *nerved; stipules elongated,* very obtuse; *spike ovate, continuous,* 5 – 8-flowered, *about the length of the peduncle;* fruit oval, apiculate with the style, not keeled when fresh, *upper portion of embryo* coiled inward and *lying transverse to the fruit.* — Slow streams and ponds, Canada and N. Eng. to western N. Y. and Mich. Sept., Oct. (Eu.)

22. **P. pauciflòrus,** Pursh. *Stem filiform, flattish and very branching; leaves narrowly linear* (1 – 2′ long and seldom ½″ wide), acute, *obscurely* 3-*nerved; stipules obtuse; spikes* capitate, 1 – 4- (*usually* 2-) *flowered,* on short club-shaped peduncles; *fruit roundish-lenticular;* the *back* more or less *crested;* upper portion of the embryo incurved in a circle. — Still or stagnant waters, N. Brunswick to Ga., Iowa, Minn., and westward.

Var. **Niagarénsis,** Gray. Stem often longer (1 – 3°); leaves larger (1½ – 3½′ long by 1″ wide or less), 3 – 5-nerved at base, very acute and mucronate, narrowed to the subpetiolate base. (P. Niagarensis, *Tuckerm.*) — Running water, Great Lakes to S. C.; also in Cal.

23. **P. pusíllus,** L. *Stem slender,* flattish or nearly cylindrical, often very branching; *leaves narrow- or setaceous-linear,* acuminate, *acute or subacute,* 1 – 3-*nerved,* furnished with *translucent glands* on each side at the base; stipules at first obtuse; spikes interrupted or capitate, 2 – 8-flowered, on rather long peduncles; *fruit* obliquely elliptical, *scarcely keeled; apex of embryo* incurved and *directed obliquely downward.* — Pools and ditches, N. Scotia to N. J., west to Minn. and Mo., and westward. — Leaves sometimes almost setaceous (var. tenuissimus, *Koch*).

Var. **polyphýllus,** Morong. Dwarf form (3 – 5′ high), divaricately branching from the base, very leafy throughout; leaves very obtuse, not cuspidate, 3-nerved; non-flowering but abundantly provided with propagating buds which are formed on the thickened and hardened ends of the branches and closely invested by imbricated leaves. — In a shallow pool, S. Natick, Mass.

24. **P. mucronàtus,** Schrad. Resembling P. pusillus, but stem less branching; *leaves broader* (almost 1″ wide), *often 5-nerved; spikes interrupted.* (P. pusillus, var. major, *Fries.*) — N. Brunswick to western N. Y., Mich., and Minn. July. (Eu.)

25. **P. gemmíparus,** Robbins. Stem filiform, branching, terete, varying greatly in height; *leaves hair-like,* sometimes not as broad as the stem, often with no apparent midrib, *tapering to the finest point* (1 – 3′ long), bi-glandular at base; stipules ½ – 1′ long; spikes few (3 – 6-flowered), *interrupted,* on long filiform peduncles; *propagating buds very numerous;* fruit like that of P. pusillus, very rare. (P. pusillus, var. ? gemmiparus, *Robbins.*) — Slow-moving streams and still water, Mass. Aug., Sept.

26. **P. Tuckermàni,** Robbins. *Very slender and delicate* from a creeping rootstock, of a fine light green; stem filiform with several short and repeatedly dichotomous leaf-bearing branches; *leaves* thin and flat, but *setaceous and tapering to near the fineness of a hair* (1–4′ long and ½″ extreme width), obscurely 1–3-nerved, with a few coarse reticulations; stipules rather persistent below, ½′ long, obtuse; *peduncle solitary, very long,* rather thickened upward; *spike* 4–8-*flowered, in fruit continuous, oblong; fruit thick-lenticular,* obscurely 3-keeled; *nutlet slightly impressed on the sides; shell thick and hard;* embryo nearly annular. — Cold ponds, White Mountains of N. H., N. Y., and N. J.

* * *Stipules united with the sheathing base of the leaf.*

27. **P. pectinàtus,** L. *Stem filiform,* repeatedly dichotomous; *leaves very narrowly linear,* attenuate to the apex, 1-nerved with a few transverse veins; *spikes interrupted,* on long filiform peduncles; fruit obliquely broad-obovate, compressed, *bluntly keeled;* shell of nutlet very thick; *embryo spirally incurved.* — N. Brunswick to Fla., westward across the continent. Aug.–Oct. (Eu.)

28. **P. marinus,** L. Resembling narrow-leaved forms of the last species, *low and very leafy;* peduncles much elongated; *fruit much smaller* (1″ long) and thinner, round-obovate, *not keeled* upon the rounded back, tipped with the broad sessile stigma; *embryo annular.* — Western N. Y., Ill., Mich., and southward. Probably the range of this species is much more extensive than indicated, as it has been confounded with P. pectinatus.

29. **P. Robbinsii,** Oakes. *Stem* ascending from a creeping base, *rigid,* very branching, *invested by the bases of the leaves and stipules; leaves crowded in two ranks, recurved-spreading,* narrow-lanceolate or linear (3–5′ long and 2–3″ wide), acuminate, *ciliate-serrulate* with translucent teeth, many-nerved; stipules obtuse when young, their nerves soon becoming bristles; *spikes numerous, loosely few-flowered,* on short peduncles; fruit oblong-obovate (2″ long), *keeled with a broadish wing,* acutely beaked; embryo stout, ovally annular. — In ponds and slow streams, N. Brunswick to N. J., the N. shore of L. Superior, and far westward.

4. RÚPPIA, L. Ditch-grass.

Flowers perfect, 2 or more approximated on a slender spadix, which is at first enclosed in the sheathing spathe-like base of a leaf, entirely destitute of floral envelopes, consisting of 2 sessile stamens, each with 2 large and separate anther-cells, and 4 small sessile ovaries, with solitary campylotropous suspended ovules; stigma sessile, depressed. Fruit small obliquely ovate pointed drupes, each raised on a slender stalk which appears after flowering; the spadix itself also then raised on an elongated thread-form peduncle. Embryo ovoid, with a short and pointed plumule from the upper end, by the side of the short cotyledon. — Marine herbs, growing under water, with long and thread-like forking stems, and slender almost capillary alternate leaves, sheathing at the base. Flowers rising to the surface at the time of expansion. (Dedicated to *H. B. Ruppius,* a German botanical author of the early part of the 18th century.)

1. **R. maritima,** L. Leaves linear-capillary; nut ovate, obliquely erect, 1½″ long; fruiting peduncles capillary (3–6′ long); stipes 1–12″ long. — Shallow bays, along the entire coast; also occasionally in saline places in the interior. (Eu., Asia, etc.)

5. ZANNICHÉLLIA, Micheli. Horned Pondweed.

Flowers monœcious, sessile, naked, usually both kinds from the same axil; the sterile consisting of a single stamen, with a slender filament bearing a 2–4-celled anther; the fertile of 2–5 (usually 4) sessile pistils in the same cup-shaped involucre, forming obliquely oblong nutlets in fruit, beaked with a short style, which is tipped by an obliquely disk-shaped or somewhat 2-lobed stigma. Seed orthotropous, suspended, straight. Cotyledon taper, bent and coiled. — Slender branching herbs, growing under water, with mostly opposite long and linear thread-form entire leaves, and sheathing membranous stipules. (Named in honor of *Zannichelli,* a Venetian botanist.)

1. **Z. palústris,** L. Style at least half as long as the fruit, which is flattish, somewhat incurved, even, or occasionally more or less toothed on the back (not wing-margined in our plant), nearly sessile; or, in var. PEDUNCULÀTA, both the cluster and the separate fruits evidently peduncled. — Ponds and slow streams, throughout N. America, but not common. July. (Eu., Asia.)

6. ZOSTÈRA, L. Grass-wrack. Eel-grass.

Flowers monœcious; the two kinds naked and sessile and alternately arranged in two rows on the midrib of one side of a linear leaf-like spadix, which is hidden in a long and sheath-like base of a leaf (spathe); the sterile flowers consisting of single ovate or oval 1-celled sessile anthers, as large as the ovaries, and containing a tuft of threads in place of ordinary pollen; the fertile of single ovate-oblong ovaries attached near their apex, tapering upward into an awl-shaped style, and containing a pendulous orthotropous ovule; stigmas 2, long and bristle-form, deciduous. Utricle bursting irregularly, enclosing an oblong longitudinally ribbed seed (or nutlet). Embryo short and thick (proper cotyledon almost obsolete), with an open chink or cleft its whole length, from which protrudes a doubly curved slender plumule. — Grass-like marine herbs, growing wholly under water, from a jointed creeping stem or rootstock, sheathed by the bases of the very long and linear, obtuse, entire, grass-like, ribbon-shaped leaves (whence the name, from ζωστήρ, *a band*).

1. **Z. marina,** L. Leaves obscurely 3–5-nerved. — Common in shoal water of bays along the coast, from Newf. to Fla. (Eu.)

7. NÀIAS, L. Naiad.

Flowers dicœcious or monœcious, axillary, solitary and sessile; the sterile consisting of a single stamen enclosed in a little membranous spathe; anther at first nearly sessile, the filament at length elongated. Fertile flowers consisting of a single ovary tapering into a short style; stigmas 2–4, awl-shaped; ovule erect, anatropous. Fruit a little seed-like nutlet, enclosed in a loose and separable membranous epicarp. Embryo straight, the radicular end downward. — Slender branching herbs, growing under water, with opposite and linear leaves, somewhat crowded into whorls, spinulose-toothed, sessile and dilated at base. Flowers very small, solitary, but often clustered with the branch-leaves in the axils; in summer. (Naïás, *a water-nymph.*)

1. **N. marina,** L. *Stem rather stout and often armed with broad prickles; leaves broadly linear* (3–18″ long), *coarsely and sharply toothed,* the dilated base entire; fruit 2–2½″ long; *seed very finely lineate, oblong,* slightly compressed.

(N. major, *All.*) — Marshes and salt-springs of western N. Y. and Mich. Teeth of one or more brownish cells upon a many-celled base. (Eu.)

Var. **grácilis,** Morong. Internodes long (1–3′) and nearly naked, with only a few teeth above; leaves very narrow, the dilated base also toothed; fruit smaller. — Canoga marshes, western N. Y.; also in Fla.

Var. **recurvàta,** Dudley. Stems short, inclined to be dichotomously branched, recurved-spreading; leaves usually recurved, the teeth prominent, the dilated base with a projecting tooth each side. — Cayuga marshes, N. Y.

2. **N. fléxilis,** Rostk. & Schmidt. *Stems usually very slender; leaves very narrowly linear* (½–1′ long), *very minutely serrulate;* fruit 1½″ long, narrowly oblong; *seeds lance-oval, smooth and shining.* — Ponds and slow streams, N. Scotia to S. C., Iowa and Minn. Teeth on the margins of the leaves 1-celled. (Eu.) — Var. ROBÚSTA, Morong. Stem stout, few-leaved, sparsely branching, elongated; leaves flat, abruptly acute. — E. Mass., Mich., and Tex.

3. **N. Índica,** Cham., var. **gracíllima,** A. Br. Branches alternate; *leaves* very narrowly linear, *nearly capillary,* straight, *serrate, the rounded lobes of the sheathing base spinulose-ciliate; fruit linear, impressed-dotted between the numerous ribs.* — Mass. to Penn., west to Ind. and Mo. Teeth of 3 cells each.

ORDER 127. ERIOCAÙLEÆ. (PIPEWORT FAMILY.)

Aquatic or marsh herbs, stemless or short-stemmed, with a tuft of fibrous roots, a cluster of linear and often loosely cellular grass-like leaves, and naked scapes sheathed at the base, bearing dense heads of monœcious or rarely dicœcious small 2–3-merous flowers, each in the axil of a scarious bract; the perianth double or rarely simple, chaffy; anthers introrse; the fruit a *2–3-celled 2–3-seeded capsule;* seeds pendulous, orthotropous; embryo at the apex of mealy albumen. — Chiefly tropical plants, a few in northern temperate regions.

1. **Eriocaulon.** Perianth double, the inner (corolla) tubular-funnel-form in the staminate flowers; stamens twice as many as its lobes (4). Anthers 2-celled.
2. **Pæpalanthus.** Perianth as in the last; stamens only as many as the corolla-lobes (3). Anthers 2-celled.
3. **Lachnocaulon.** Perianth simple, of 3 sepals. Stamens 3, monadelphous below. Anthers 1-celled.

1. ERIOCAÙLON, L. PIPEWORT.

Flowers monœcious and androgynous, i. e. both kinds in the same head, either intermixed, or the central ones sterile and the exterior fertile, rarely dicœcious. *Ster. Fl.* Calyx of 2 or 3 keeled or boat-shaped sepals, usually spatulate or dilated upward. Corolla tubular, 2–3-lobed, each of the lobes bearing a black gland or spot. Stamens twice as many, one inserted at the base of each lobe and one in each sinus; anthers 2-celled. Pistils rudimentary. *Fert. Fl.* Calyx as in the sterile flowers, often remote from the rest of the flower (therefore perhaps to be viewed as a pair of bractlets). Corolla of 2 or 3 separate narrow petals. Stamens none. Ovary often stalked, 2–3-lobed, 2–3-celled; style 1; stigmas 2 or 3, slender. Capsule membranaceous, loculicidal. — Leaves mostly smooth, loosely cellular and pellucid, flat or concave above. Scapes or pedun-

cles terminated by a single head, involucrate by some outer empty bracts. Flowers, also the tips of the bracts, etc., usually white-bearded or woolly. (Name compounded of ἔριον, *wool,* and καυλός, *a stalk,* from the wool at the base of the scape.) — Our species are all stemless, wholly glabrous excepting at the base and the flowers, with a depressed head and dimerous flowers.

1. **E. decangulàre,** L. *Leaves obtuse,* varying from linear-lanceolate to linear-awl-shaped, rather rigid; scapes 10–12-ribbed (1–3° high); head hemispherical, becoming globular (2–7″ wide); scales of the involucre acutish, straw-color or light brown; *chaff* (bracts among the flowers) *pointed.* — Pine-barren swamps, N. J. to Fla. July–Sept.

2. **E. gnaphalòdes,** Michx. *Leaves spreading* (2–5′ long), *grassy-awl-shaped,* rigid, or when submersed thin and pellucid, tapering gradually to a *sharp point,* mostly shorter than the sheath of the *10-ribbed scape;* scales of the involucre very obtuse, turning lead-color; *chaff obtuse.* — Pine-barren swamps, N. J. to Fla.

3. **E. septangulàre,** Withering. *Leaves short* (1–3′ long), *awl-shaped, pellucid,* soft and very cellular; *scape 4–7-striate,* slender, 2–6′ high, or when submersed becoming 1–6° long, according to the depth of the water; *chaff acutish;* head 2–3″ broad; the bracts, chaff, etc., lead-color, except the white coarse beard. — In ponds or along their borders, Newf. to N. J., west to Ind., Mich., and Minn. July, Aug. (Eu.)

2. PÆPALÁNTHUS, Martius.

Stamens as many as the (often involute) lobes of the funnel-form corolla of the sterile flowers, and opposite them, commonly 3, and the flower ternary throughout. Otherwise nearly as in Eriocaulon. (Name from παιπάλη, *dust* or *flour,* and ἄνθος, *flower,* from the meal-like down or scurf of the heads and flowers of many South American species.)

1. **P. flavídulus,** Kunth. Tufted, stemless; leaves bristle-awl-shaped (1′ long); scapes very slender, simple, minutely pubescent (6–12′ high), 5-angled; bracts of the involucre oblong, pale straw-color, those among the flowers mostly obsolete; perianth glabrous; sepals and petals of the fertile flowers linear-lanceolate, scarious-white. — Low pine-barrens, S. Va. to Fla.

3. LACHNOCAÙLON, Kunth. HAIRY PIPEWORT.

Flowers monœcious, etc., as in Eriocaulon. Calyx of 3 sepals. Corolla none! *Ster. Fl.* Stamens 3; filaments below coalescent into a club-shaped tube around the rudiment of a pistil, above separate and elongated; anthers 1-celled! *Fert. Fl.* Ovary 3-celled, surrounded by 3 tufts of hairs (in place of a corolla). Stigmas 3, two-cleft. — Leaves linear-sword-shaped, tufted. Scape slender, bearing a single head, 2–3-angled, hairy. (Name from λάχνος, *wool,* and καυλός, *stalk.*)

1. **L. Michaùxii,** Kunth. — Low pine-barrens, Va. to Fla.

ORDER 128. CYPERÀCEÆ. (SEDGE FAMILY.)

Grass-like or rush-like herbs, with fibrous roots, mostly solid stems (culms), *closed sheaths, and spiked chiefly 3-androus flowers, one in the axil of each of the glume-like imbricated bracts* (scales, glumes), *destitute of any perianth,*